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THE SCHOOL REVIEW MONOGRAPHS
Issued in Co-operation with The Society of College Teachers of Education

NUMBER I

Research within the Field of Education, Its Organization and Encouragement

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Research within the Field of Education, Its Organization and Encouragement

BY

ELLWOOD P. CUBBERLEY
Leland Stanford Junior University

WALTER F. DEARBORN
School of Education, The University of Chicago

PAUL MONROE
Teachers College, Columbia University

EDWARD L. THORNDIKE
Teachers College, Columbia University

Papers Presented for Discussion at the Meeting of the Society of College Teachers of Education, Mobile, Alabama
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FUNDAMENTAL ADMINISTRATIVE PROBLEMS

ELLWOOD P. CUBBERLEY
Professor of Education, Leland Stanford Junior University

I have been asked to state some of the more fundamental administrative problems, financial in nature, which are at present in urgent need of study and which may be solved, in part at least, by united effort on the part of students of education. Without taking time for any preliminaries, and without attempting to present any comprehensive outline, I will briefly describe three major administrative problems upon which we can profitably expend a large amount of effort. The present status of educational organization and interest makes the study of these three problems especially opportune.

I. THE PROBLEM OF FINANCE

The problem which underlies all other problems in school administration is the problem of securing adequate finance. Many things we desire and talk about very much are impossible until this key problem—finance—has been solved in a satisfactory manner. Almost everywhere this is a pressing problem. But few states have as yet evolved any rational scheme either for the raising of revenue for the support of education or for the apportionment of the revenue after it has been collected. Not only is the revenue levied for the maintenance of public schools inadequate, but the basis upon which the revenue is raised is one that never will give good results. The methods and the units of taxation are fundamentally wrong, and no satisfactory state system of education can be evolved until a new and a better basis for securing revenue has been put into operation. We may talk as much as we like about improving the teacher, the conditions of education, the rural schools, etc., but with little real result unless additional revenue is provided. Real improvement along such lines is fundamentally a question of money.

What is needed most in the large majority of our states is sufficient revenue to provide a good system of schools throughout the state, and this can never be in such states as Indiana, Illinois, Missouri, or Kansas, under present taxation and apportionment laws. Local maintenance and the census basis of apportionment are both thoroughly bad, and should be superseded by better plans as soon as can be done. In another place[1] I have illustrated the conditions and the way out in some detail, and I do not need to elaborate the matter here.

This financial problem is one which can be worked upon with excellent results by men in almost every state in the Union. Everywhere, almost, our so-called educational leaders are trying to find a solution for their financial difficulties, but the only way out they seem to know is that of raising the tax rate. It may be necessary to raise the school tax in any case, but raising the tax alone will never give the results desired. The taxation and apportionment plans of the states must be overhauled as well. What is needed, in most of our states, is a new campaign of education along the financial side. The first to be educated will need to be the schoolmasters themselves. When they have thoroughly grasped the significance and difficulties of the financial problem, a campaign of education with the purpose of educating the public will be necessary. The old principle that the wealth of the state should educate the children of the state needs to be insisted upon anew, and it must be insisted upon that the burdens and advantages of education shall be more nearly equalized. The fundamental problem, for example, in such states as Illinois, Missouri, and Kansas is a problem of taxation and revenue, while in such states as Michigan and Texas it is more a problem of apportionment.

So long as our school systems remain local school systems, as opposed to being parts of a real state school system, but little fundamental educational progress can be made. What is needed in every state is a system of school support which makes the child to be educated the basis, and a system of apportionment which clearly recognizes the unit of cost in education—the teacher.

[1] *School Funds and Their Apportionment.* Teachers College Contributions to Education, No. 2.

This problem of taxation and apportionment is the most thoroughly fundamental problem in the administrative side of education today. Careful statistical studies of conditions and needs should be made in each state, following the lines of the general study cited. With the facts and figures thus collected, the campaign for a better financing of education can be begun.

II. THE PROBLEM OF COUNTY REORGANIZATION

Closely connected with the problem of finance and apportionment is that of a reorganization of our but slightly related town and rural and high schools along rational business and educational lines, with a view to economical and efficient maintenance. In nearly every county in the United States, a few southern states alone excepted, we find a multitude of small, inefficient, and often unnecessary schools. By a rational system of reorganization, based on educational needs and efficient service, from 20 to 60 per cent of these schools could be dispensed with, better schools and graded and high schools provided for the county, much greater returns for the same money secured, and a thoroughly rational system of school organization and supervision provided. The method by which this can be accomplished has been well set forth in a recent publication of the United States Department of Agriculture,[1] and to this I refer for a detailed explanation of the nature of the reorganization which might be effected.

To secure the best results, and to produce an educational and business-like organization, the county superintendency should also be included in the reorganization, as has been done in a few states. The county superintendent of schools should be evolved into an expert educational officer as soon as possible, and his political connections should be terminated. To secure this much-to-be-desired end, he should be appointed by a board, preferably an elected county board of education, and appointed because of professional and administrative capacity, and without reference to residence or political affiliation. In other words, the office should be thrown open to brains and capacity, and the present protective

[1] George W. Knorr, *Consolidated Rural Schools and the Organization of a County System*, Bulletin No. 232, Office of Experimental Stations.

tariff levied in favor of the home politician should be withdrawn in the interests of the children. The sooner we take our county school systems entirely out of politics and place them on a basis closely analogous to our city school systems, the better it will be for the schools.

This would give us county boards of education, composed of laymen, closely analogous to city boards of education, which would select and appoint the county superintendent and a sufficient number of deputies properly to supervise the schools of the county, and would oversee all business and financial affairs. In conjunction with the superintendent this body could proceed to reorganize the school system of the entire county along rational educational and business lines. Useless and inefficient schools could be dispensed with, central graded schools established where needed, rural high schools provided, and close and adequate professional supervision instituted at, in general, no greater total outlay than is now necessary to maintain an unnecessary number of small and inefficient schools.

A series of studies could be made, by counties, following the lines laid down by Mr. Knorr in the document cited, which would do much to help along a movement for rational county school organization.

III. THE STUDY OF UNITS OF COST

In the investigation of this topic we are as yet only in the merest beginnings. The pioneer studies of Elliott and Strayer[1] have thrown some real light on the nature and difficulties of the problem, and have paved the way for further work. The United States Bureau of Education will issue, some time during the year, a bulletin containing a study of the data collected by the Census Office with reference to educational systems. This will form another valuable contribution to the subject, and bring us a little nearer to the study of units of cost. The national bureau is also, in connection with the Association of School Accounting Officers, the Department of Superintendence of the National Education Association, and state and city school officers, trying to secure

[1] Teachers College Contributions to Education Series.

agreement upon uniform forms for accounting and arranging statistical data. This is a necessary first step. There must be uniformity in data before we can compare different systems. Once uniformity in accounting is secured we can then proceed to a study of the various units of cost for school systems of different sizes and located in different parts of the county, and gradually establish certain cost units, or norms of expenditure.

Of these, we know almost nothing today, and the variations between school systems on different items of cost are very large—too large to be explained on a basis of varying degrees of efficiency. While a certain latitude as to expenditure must always be allowed for between different school systems, the introduction of business methods of estimating and auditing expenditures cannot help but be of service. There can be little doubt but that there are at present many unrecognized financial wastes in the administration of our schools, county and rural as well as city and town, which a study of units of cost will reveal and correct; and there also can be little doubt but that there is much very unwise expenditure which a comparative study of units of expenditure will lay bare. The purpose of all such studies is not so much to reduce total cost as to secure greater returns from the money expended.

This problem is a large one, and one which may engage the efforts of many workers for the next decade, at least. It is one of the most important administrative problems now before us, and the co-operation of many workers and institutions is desirable.

EXPERIMENTAL EDUCATION

WALTER F. DEARBORN
Associate Professor of Education, The University of Chicago

A systematic statement of experimental problems in education within the limits of this paper could result in little more than an enumeration of titles. A sufficient estimate of the present status of experimental work in education, which it is the object of this paper to present, may possibly be as well secured by reviewing in some detail two or three typical problems or lines of investigation. We shall choose for this purpose problems which have thus far been studied mainly in the psychological laboratory with a view to showing that, so far as the educational experimenter is concerned, they may now best be studied in the form of the school experiment.

In arguing for the school experiment the writer would not, however, have it be forgotten that in existing school records and reports, and in present school practices, there is already accumulated or available a body of data which, if properly evaluated, just as truly represents the results of experimental investigation as any new experiments might do. School practices always represent great educational experiments; and in summoning laborers into the field it may be well to remember that the fields are already white unto the harvest and that reapers now are needed quite as much as the sowers and planters of new experiments. The statistical studies of Thorndike, Ayres, and others have uncovered results which it would take years of new experimentation to establish. School superintendents and principals may well concern themselves first with these evidences of what has been going on in their schools before raising the question of new experiments. Comparisons of the differences in the retardation and elimination of large city with small city or town schools and their causes; of the effect in these respects of the manual-training or commercial high school compared with that of the usual type of high school; a determination of what sort of pupils go to these schools as judged, for one

thing, by their previous records in the elementary schools; studies of the relative standing of pupils in the elementary and high school as evidence not only of the relation between different school institutions, but also of the correlation of subjects and departments of study; these are but examples of the more special problems that have grown out of these general studies.

Even some of the specious reasoning of staunch defenders of formal discipline may be exposed, or at least tested, by existing school records. Professor Shorey in his recent annotated tirade in defense of classical education cites among others the article of the Amherst professor of biology who found that the classical students in his classes were superior to the scientific and attributed that fact to the superior training afforded by the greater complexity of grammatical forms and construction of the classical languages as opposed to the modern, being quite oblivious to the possibility that classical students in his institution may have been a superior group of students to start with, superior to the rank and file before they started upon their classical training. A comparison of the elementary and high-school records of these two groups of students would have been a good way to have begun this investigation. Available results show that students tend to maintain in very considerable numbers the same relative rank in the university which they secured in the high school; and, with more limited evidence as yet available, the same result appears to hold of the elementary school and high school. Ability, or the lack of it, so far as these studies indicate, appears to come early to light and to be relatively little influenced by subsequent training. Had the classical students stood out superior as a group throughout elementary and high schools the above observations would lose a good deal of their force. It is an illustration of how inexact and careless the methods of the exact scientist may be when he ventures out of the limits of his own field—an observation which points to a specialization of the effects of training; scientific method *may* be associated only with the body of data in which it is acquired and practiced.

It is to the experimental status of this old question of formal discipline that I wish first to refer, as an example of a problem which,

so far as its experimental aspects are concerned, has been chiefly worked out in the laboratory, but has recently been "transferred" as a definite experiment to the classroom. The summaries of the experimental literature of this subject which have recently appeared are not sufficiently critical in their nature. A careful reading of the original literature does not give the impression as a whole of the thoroughgoing and solid contributions which we might expect in a problem of its importance and on a question which is under almost constant discussion. It seems to be easier to talk than to experiment about this question. However, the problem has been analyzed, methods of work established, experimental pitfalls exposed, and a not inconsiderable body of results attained.

Recent work has led to a partial reaction from the extreme view of the specialization of the mind to which the early experiments pointed, but experimental evidence still shows that the influence of special training *may* be very circumscribed in its effect even on what appear to be closely related abilities. The question is now confined to a study of the conditions under which transference is operative, to the factors to which it is due, and especially to the extent to which it may be carried.

There will be advantages in working out some of these factors in the classroom. Winch has been one of the first to make these experiments in school. His articles reporting the results of this work are models of exposition and statement and in this respect are a great relief from the unnecessary obscureness of the tabulation and report of results in several of the earlier works. They are also, for the most part, well arranged as to method and are examples of the sort of experiment to be advocated. They fall, however, very far short of the ideals of such experimentation. One hundred children, in one of his first experiments, were divided into sections, and their memories were tested with passages from a historical reader. One section then practiced for ten minutes a day for four days in learning poetry while the other section went on with the regular class work. On the fifth day both sections were again tested for their ability to learn passages from the historical reader, with the result that the section which had been learning poetry learned on an average eight or nine more words, or about 10 per cent more,

than the other section. From this meager data the following conclusion is drawn: "The conclusion seems definite and clear. Improvement gained by practice in memorizing one subject of instruction is transferred to memory work in other subjects whose nature is certainly diverse from that in which the improvement was gained."

There is no analysis of the nature of the transference, of the factors involved, of the relation of the amount and sort of improvement to the extent and quality of transference—questions which the laboratory experiments have prepared us for. As though the question of mental discipline were to be settled thus simply by some forty minutes of training!

A second and more recent experiment of Winch concerns the question, "Does improvement in accuracy of numerical computation 'transfer' to arithmetical reasoning?" In the first school the practiced group of sixteen were trained for forty minutes for four days with the result that five out of the sixteen made on the average some gain. Seven did practically the same at the end of the test practice as at the beginning, and four did poorer. The experimenter, however, goes gravely on to test the amount of transference to arithmetic reasoning, although what he expected to find transferred from such a practice it is impossible to imagine. The result was that the group which had had no training, in every case but one, did better in arithmetical reasoning than the group which had been trained. The author concludes: "It is difficult to resist the conclusion that the group practiced in accuracy of computation shows no improvement over the group not thus practiced, i.e., there appears to be no transfer of improvement in accuracy from arithmetical computation to arithmetical reasoning."

There is no difficulty in resisting the conclusion; the difficulty lies in seeing why any conclusion at all should have been expected from such data. Here is a problem which needs to be worked out in school, but not by such insufficient experiments as these. If one is to study the transference of improvement, he may at least be expected to have first secured some improvement which may be subject to transference. Furthermore, children of the age tested

have already had several years of school training in numerical computation. It is not to be expected that a few hours of additional training will modify this ability so fundamentally as to affect materially the different sort of mental processes involved in the reasoning of arithmetical problems; three or four hours of training will hardly stand out clear-cut above the training, experience, and habits of years of similar work.

If this is to be a serious school experiment, practice should be carried out for months at a time, and longer. The entire subject may be dropped for a year or more from the work of one class or group and carried on with regular and persistent practice in a comparable group. Such an arrangement of work in the early years of the elementary school in view of the importance of the experiment and in view of the possible flexibility of the elementary-school course would not be an undue interference with the work of the school.

Such studies as these may lead us eventually to evaluate and take account of the rate of progress and improvement in all our classes and for over long periods of time. If, instead of the present haphazard giving of examinations and tests, concerned only with testing the attainment of the moment and with little thought or reference to what has preceded or what follows, we should relate successive tests and examinations and make them measures of a student's progress throughout a course of study, we should not only give a significance to the examinations which they now lack, but we might thereby accumulate a fund of information in regard to practice improvement in school studies which will be prerequisite to any thoroughgoing investigation of the general influence to such training.

Even this cursory statement and review may suffice to assure us of the opportunities for discriminative investigation in adapting the problem of mental discipline to school studies.

One other illustration may be given of laboratory problems which are ready for school experimentation, by citing the bearing on school work of recent studies in the psychology and pedagogy of reading.

There is practical unanimity of opinion as to the desirability

of teaching reading by the word method rather than by letters, but no sufficient inquiry has been made as to the extent to which children who have been so taught read by word-wholes. Experiments have shown that many educated adults do not read by words. Although that is not a sufficient reason for deciding that children should not be so taught, it does raise a presumption that there may be a real underlying difficulty which may make it hard for *some* children to learn to read in this way. It has been found by study of adults that the eyes in moving across the page in reading make several distinct stops in each line, and that these pauses of the eye are necessary in order that brief glimpses may be taken along the line, since the eye does not see sufficiently for reading when it is in motion. For many adults a single pause is sufficient for each word or short phrase of ordinary reading; for others, however, more pauses seem necessary, and sometimes two and occasionally even three are made in the same word. Some readers, therefore, read by smaller units than others and, except for common words, do not read by word-wholes.

These differences may be natural or they may be the acquired results of early training, i.e., (1) the working span of visual perception of some readers may be so narrow or contracted that they cannot or do not conveniently read as much as a long word at a time, or (2) the differences may be due to faulty habits which were established in learning to read. In the latter case, larger units might be read had these readers formed the habit to begin with, just as cramped and awkward habits of writing are not necessary and may be changed. Bad form is doubtless, as Huey has remarked, as distressingly common in reading as it is in many other accomplishments.

In so far, then, as these adult differences are natural, we should expect to find them in children, for some of whom, therefore, words may not be the best units of perception in reading. In so far, on the other hand, as the method of reading is largely the result of early habits, these should be more successfully controlled. We attempt to do this when learning to write and, although the movements of the eyes are very much less under conscious direction than are the movements of the fingers, hands, and arms, which are

involved in writing, they can be controlled and modified, and one of the important problems in reading is the development of satisfactory methods of doing this.

It is not, therefore, sufficient to announce that we are teaching by the word-method and assume that children are reading by words. Teachers may put words on the board, wave their pointers under or over them to "unify" them, and, notwithstanding their efforts, find, if they will take the pains to discover it, that some of the children in their classes are putting together elements which *they* have singled out as seeming to be significant, and building up words as elaborately as if they had been taught their letters to start with.

However good the method, we should first test its results and discover as to how far it is being used or, if possible, as to how far it can be used successfully by pupils. For this purpose in the case of reading and learning to read, experiments on children with the short exposure apparatus and by registration of the movements of the eyes in reading are furnishing means of testing and establishing controls of children's reading. Furthermore, we may well give attention to determining in how far words *as wholes* possess the sufficiently characteristic visual forms, to be differentiated one from the other, and, contrariwise, in how far they lack these distinctions, and, therefore, necessitate attention to and recognition of smaller elements. The preliminary work of Messmer has indicated the possibility of such analysis of the distinction between words, so that in teaching we may be able to call attention to the differences in the appearance and form of words, as we used to do as a matter of course in the teaching of letters. No word-method of teaching reading is possible in any real sense until this has been accomplished. It seems likely, however, from present indications that both because the differences between words as wholes, i.e., apart from some recognition of their elements, are not sufficiently great, and because some readers naturally prefer smaller units than words, our conceptions of the word-method of the teaching of reading will need some modifications.

This brief statement of the present status of some few of the experimental problems in education may serve to indicate the op-

portunities and need for such experimentation. The experimental psychologist, to whom experimental education is so largely indebted for its inception, tired of verifying Weber's law or of testing general intelligence, and patiently waiting the call of a college presidency or disappearing with the passing years into the Elysian fields of philosophy, may here find a welcome, and an outlet for his energies. But it is to the teachers of education and in particular to the members of this society of college teachers of education that the opportunities for experimental work should appeal. The superintendent and principal of schools will in time be more of an experimenter, if not less of an administrator; at present, with his limited time for such work, his energies may well be directed to evaluating the results of current practice. Through the bringing about of changes in educational methods by devising and carrying out new school experiments, and by testing the results of old, by attacking problems of theoretical interest as well as of practical value, the opportunity rests with the college departments of education of greatly modifying educational practice. The last decade or so has been marked in university administration by the rapid establishment and development of numerous college departments of education; in no better way can their creation be justified than in their contributions to the work of experimental education.

CO-OPERATIVE RESEARCH IN EDUCATION

PAUL MONROE
Professor of the History of Education, Teachers College, Columbia University

CHARACTER OF COLLEGIATE AND UNIVERSITY WORK IN THE SUBJECT OF EDUCATION

The function of a higher institution of learning respecting any particular subject is twofold: first, the dissemination of knowledge scientifically organized and tested; and, second, the discovery and organization of new truths. The entire educational system from the kindergarten to the university has the first of these as its chief aim, using this dissemination of knowledge as a means, both for the development of the individual units of society to the highest degree of efficiency and perfectability and for the stable ordering and improvement of society as a whole. So vast and important is this phase of the function of an educational system that the higher and more specialized function—that of advancing the bounds of knowledge—can properly be left to the highest institution of our educational system. But at this stage the work of research cannot be neglected, though that of the dissemination of organized knowledge may yet be by far the more important part of the work of the institution, quantitatively measured.

It is no part of the purpose of this conference to define the purpose of research in general, for as university men we are presumably in sympathy with such work and fairly acquainted with the great underlying purposes, the general principles of methods, and with the outlines of the fields involved. But as representatives of the latest branch of knowledge to receive a scientific—or pseudo-scientific organization, as some would have it—it behooves us to survey as definitely as possible those phases of our subject demanding investigation or offering opportunities for it, to estimate the value of this inheritance into which we may enter, and to formulate the purposes for which these endowments of opportunity should be used. As is apt to be true with respect to any newly organized

subject, there is less agreement among students of education than among the devotees of those branches of knowledge longer organized, regarding the types of problems worthy of investigation, the methods to be used, the purposes involved, the organization of work of research, and the encouragement to be given to it.

NECESSARY STEPS IN RESEARCH WORK AND THE OPPORTUNITY FOR CO-OPERATION

We may compare the general process of research work with the traditional Herbartian "Steps" in the recitation.

First, there is preparation.—In research, this consists in the general outlining of the field, the selection of the particular topic, the determining of the method to be used. Too frequently the topic is accidentally stumbled on by the student, or even by the instructor; too frequently the topic is viewed wholly in isolation, an isolation which is apt to be emphasized when the investigation so magnifies the student's information about the particular phase of the topic that all perspective is lost.

There are numerous problems for the instructor in regard to each of these. Just how far the instructor is under obligation to suggest topics, to give assistance, and to reveal the whole field of his own intellectual interests and give to the student the results of his own investigations in the field is a question. I believe that in American institutions, and in our own field especially, we are inclined to give the student more rather than less assistance than he should have for his own good. But this much is due to him: he should be led to see the relation of his topic to the entire field, to phases of the subject which have been tested by modern methods and to phases which remain uninvestigated. Methods, of course, cannot fully be mastered until they are tried; and the chief purpose of the investigation, so far as the individual student is concerned, is his mastery of method. But the general character of the methods should be made clear by familiarizing him with similar pieces of work.

The general cataloguing of thesis subjects already being worked upon, such as that attempted by the American Historical Society through its organ, the *American Historical Review*, is of very great

assistance. If this society would attempt a similar task in the field of education, extending it to include a list of theses previously published or accepted and on file, it would be a great practical service. Such a list would in a way outline the field.

It is evident that an essential of research work is perfect freedom. There should be no restriction of individual or institutional effort. Hence any further co-operative analysis of the field is perhaps impossible. Certainly none should be attempted that would carry with it any restriction of the field of inquiry either for individual or for institution. Let each adopt his own method, determine his own field, select his own topic, reach his own conclusions, and receive as his just reward the searching criticism of his colleagues.

It would be possible, however, for this society, after having listed the pieces of research work accomplished, to formulate a list of problems the investigation of which was desirable, or to reserve through an open list a topic upon which any student is working. Such a co-operative work would have its advantage; though there would be the disadvantage which inheres in any such plan even if it is limited to one institution or even a department, namely, that of having the work or the ideas of one individual appropriated by another.

But how far can various individuals, instructors, and institutions co-operate in this first step? Especially is this question pertinent when there is danger in too much co-operation with students on the part of the instructor. Evidently in the general mapping out of the field, much co-operative work is in place.

Second step: collection of materials.—This is the step which attracts the student's initial interest and efforts. It is apt also to consume the greater portion of the time. And while the training involved in this process is important, the student should be led to see that it is not the most important step in the process. This is the one step where the student, unaided, can depend most upon his own resources, and he should be left to do so, with occasional suggestion from the instructor, to see that he does not go too far astray. While co-operation here is less called for by the needs of the student, he realizes very quickly that he can be greatly assisted here by the work of fellow-investigators. Just how far an

investigator, looking forward to his Doctor's degree, may be entitled to receive or even employ assistance in this respect may be an open question. But since such assistance cannot be very material until the investigator has mastered the methods involved, the intellectual injury is not apt to be great or the moral turpitude serious.

The work which the Bureau in Washington is doing in this respect is of very great value. Every assistance—through improved methods of collecting or of interpreting materials, or through greater accuracy of collection, or through greater uniformity of categories, or by whatever means—that members of this society or educators in general can give to the efforts now successfully being made to increase the value of the work of our National Department is a co-operative effort worthy of encouragement and appreciation. This society owes the commissioner its most hearty co-operation in his commendable efforts to place this work on a higher plane than it has ever reached hitherto.

The various foundations for social betterment are performing a service in this respect which is profoundly significant. These institutions have the advantage of the support of funds which makes it possible to do a type of work in the collection of materials to which the unassisted university investigator can hardly aspire. Yet I know of one recent report, in which one portion of the subject was investigated by such an endowed investigator at the cost of many thousands of dollars, and the other by a college professor out of his own experience, assiduous effort, and the meager funds he could spare from his own salary; and the value, accuracy, and effect of the one portion of the report was as great as that of the other. While these various foundations are interested in the gathering of materials for the sake of applying the conclusions reached for immediate reformatory efforts, they have all taken the most commendable attitude of making their materials of as great service as possible to the independent investigator. This generous attitude cannot be commended too highly. For the National Bureau and for foundations such as the Carnegie Institute, the Carnegie Foundation, the Sage Foundation, the General Education Board, etc., have facilities for investigation which not even our univer-

sities can hope to have. So the work of co-operation in the collecting of materials, save as its members can assist in suggestion, advice, or actual scientific contribution to these boards, or bureaus, or to similar organizations, is again slight.

However, there are problems similar to those upon which we have worked, and in which we are more immediately interested, namely, the actual conditions of the various phases of our subject in institutions of learning which are of continuous importance; and these, from the unstable situation which exists, present an ever-changing and vital problem.

Co-operation in the massing of materials presents opportunity without limit; whether such co-operation should be striven for is again another question. However, as with the first, it is a minor form of co-operation.

Third step: interpretation of materials.—Here lies the real test of the student; and herein is found the real purpose of research work in the training of prospective educators. The massing of material takes industry, patience, and intelligence; but the interpretation calls for genuine insight. It is from the process of interpretation of collected materials that results the valuable reaction of research work upon the less advanced and more general stages of education. The average teacher, the average educational administrator, the average student, is nonplussed in the face of a great mass of undigested facts or unanalyzed relations, in any complex situation. In lieu of power of penetration and of mastery based on knowledge, the student falls back upon authority, the teacher upon traditional ways of doing things, and the administrator acts upon the basis of his own limited experience and so gets something done. The successful school administrator is he who on the basis of the results can justify such actions to the people concerned, even though he may be ignorant of the possibilities of the situation and is guiltless of any scientific mastery of the data relating to his problems. It is evident that many of our educational principles and practices are just such solutions of problems. In our inability to analyze scientifically the conditions with which we have to deal, or because of our unwillingness to attempt it, we take the easiest way out. Hence we give our allegiance, say, to such a

principle as the educational equivalence of studies, to the unrestricted elective system, to a lockstep system of grading, or to the doctrine that whatever is good for a prospective college student is surely good enough for any other high-school student. It is amazing, when we reflect upon it, how few of the practical problems which confront us as educators, whether in college or in common schools, have ever been scientifically studied, and how little we have developed the spirit that seeks to investigate such complex masses of data as constitute the daily problem of teacher or administrator. To replace emotional enthusiasm with critical insight as the basis of the work of teacher and administrator, is the chief purpose of emphasizing the importance of this phase of research work.

How far co-operative effort is possible in such work is another question. Here more than anywhere else is it impossible to mechanize investigation. Interpretation is the most individualized portion of the entire process. What is needed is freedom for one's self and toleration for all others. This aspect of our subject will be discussed briefly under the following topic of types of methods. It is evident that much assistance can be derived by any student from the interpretation of similar data by other students. But again the chief condition of such assistance is perfect freedom. The chief form of co-operation here is discussion and frank criticism. Of genuine, frank, and impersonal criticism we have very little; and we appear to be intolerant of that which we have.

Fourth stage: application.—As usually considered, the work of the investigator is done when he has interpreted his materials and established his conclusions. Granting this is true, then our work as educators begins anew when our work as investigators ends. But it is an open question in many fields of educational investigation whether conclusions are really established until they have been tested by actual application. This is an advantage possessed by investigators of problems of education above those in almost every other field, even in the related social sciences; and an advantage which should not be neglected. Just how far this step of application can be considered a part of the problem of the individual investigator or his director depends upon the problem

investigated. So also does the larger question of how far co-operation among numerous investigators and educators is possible. Certainly, as in few other fields, we are interested in the immediate application or the testing of the results of our investigations in many lines, and should seek co-operatively to effect this.

An organization recently effected, having at its disposal a considerable sum to be devoted to social betterment, is willing to give $10,000 a year for research in education, if the result of the investigators can be followed up and put into actual practice. The association is interested chiefly in obtaining uniform legislation throughout the states as a basis for greater uniformity in practice and higher standards of attainment. Here is a practical test of our ability to co-operate both in research and in social endeavor. The writer confesses that it would be a matter of some difficulty to outline a group of problems meeting adequately the conditions of this offer.

Other aspects of this highest and last stage of research work in education can be discussed further if we consider the entire field of motive underlying this phase of professional training.

PURPOSES OF RESEARCH WORK IN EDUCATION

These are the same as pertain to research work in general. But at present we students of education cannot repeat too often for our own benefit the broader purposes of our efforts.

Reflex influence on all phases of educational activity.—In the first place, the ordinary work of dissemination of knowledge through all the stages in our educational system, beneath and including the universities themselves, cannot properly be done without the stimulating influence which can come from the higher work alone. The spirit of devotion to truth, the habit of critical evaluation, the moral attitude involving suppression of individual preference and prejudice, application to the point of ascetic denial, enthusiasm for the work which alone can give the highest intellectual satisfaction—these are the results of research work, the fruit of the entire educational process, which alone contain the germs of new truth and of prolongation of life. The popular work of the dissemination of knowledge can arouse enthusiasm and secure devoted

service. Affecting the masses directly, as it does, it carries its own reward. The teacher, the writer, the educational reformer, the popularizer—all have their rewards, far more immediate and far more adequate. There will be no dearth of those willing to devote themselves to these phases of educational work, for in fact the rewards are often out of all proportion to the merits. But we are just beginning to realize that whenever education is made a formal subject of instruction there is needed the fructifying influence which can come from the spirit of research alone. The teachers' institute, the training school, the normal school, the summer school, even the college course in education, is not the place in which to do research work in education. But each and all of these can be improved to a remarkable degree by the influence resulting from it. The change for the better in the work of all of these institutions which has gone on during the past generation has been due in no small degree to the influence developed through work of investigation. And since such work is just in its infancy, and its results meager, far more fundamental changes may be expected in the future.

To mention but a few of the changes which are going on will indicate the scope of this argument. The usual work with teachers in service, especially that organized institutionally, such as teachers' institutes and associations, has confined itself in the past to reinforcing motives through stimulating the emotions. The influence of such work is ephemeral at best; it often gives entirely erroneous ideas of actual problems, since emotional not ideational reactions are sought; it is temporary in its effect; and as with any emotional exaltation, the reaction often reduces to a condition less hopeful than that of the beginning. The power of impersonal, quantitative observation and of qualitative interpretation is far more to be desired as a permanent equipment of teacher or administrator.

In every respect scholastic work in education has been improved through the rudimentary attempts at research work. Education has been given, somewhat grudgingly it is true, a place in the university curriculum. Here it must justify itself, not only through work of propaganda and of organized instruction, both of a liberal and of a professional character, but by creditable work

in the application of scientific methods for the discovery of new relations to its various fields of phenomena. As a professional school in the universities, the so-called teachers' colleges or schools of education have established themselves; but this inclusion among the professional faculties of a university is due not solely to the fact that such schools give a higher training than that hitherto given to prospective members of a profession; but to the fact that they one and all have held it as part of their duty to give every one of their more advanced students some training in research. It is believed by most of us that professional training for the prospective administrator and the prospective teacher should include both the mastery of the organized fields of information concerning education, at least of one such field thoroughly, and some training in research. The public and professional approval which has come to such work has been due in no small measure to the results of this emphasis on the research element in training. Normal school, training school, institute, and college work in education, though no one of these institutions can provide for research work by the students, have felt the influence which comes from such work in university department and professional school. Through their teachers now recruited in increasing numbers from the university student group; through a marked change in method, especially in the teaching of psychology, history, and philosophy of education and other professional subjects; in the changed attitude toward methods, wherein the whole problem is looked upon not as one of devices but of understanding of psychological process and social influences and motives; in the better organization of the subjects taught through more scientific textbooks; through a growing tendency to differentiate between authority, based on empirical experience, and first-hand knowledge, based on scientifically tested data; all these more general and more elementary phases of the training of teachers and of instruction in education reveal the influence of the fragmentary attempts of a few decades of research work in education.

Benefit to the individual teacher.—When one inquires how the influence of research work in the few advanced schools may have influenced the work in the scores of normal schools and colleges and how it may affect the work of teaching and administration in

our public schools, the answer must be, chiefly through the individual. The argument usually urged for university research work in any line is its influence upon the investigator, be he student or instructor; and this indeed must be admitted to be the immediate reason. But what are some of these influences? In the first place, it may be said that no person, however well trained in methods of presentation or of instruction, can ever be the true teacher unless he realizes the difference between impression, inference, or information on the one hand and scientifically tested knowledge on the other; between first-hand knowledge, and that which may be not alone second-hand, but may have no other basis whatever than the antiquity of its acceptance by uncritical teachers. It is manifestly impossible in any line for one person, as it is even for any one generation, to avoid accepting on authority much of the beliefs and information which as a teacher he imparts to others; but the knowledge of the difference between that which is first-hand with himself or with his authority and that which is merely traditional will affect every phase of his work as a teacher. Then there is the refreshment and the invigoration which comes from drinking at the springs direct, which one can never get from the flaccid products of high degrees of distillation. It is true that such invigoration is not always the most immediate and most obvious result of research training, and that the university student fresh from the laboratory often fails to meet the practical situation. But a period of adjustment is always necessary. For the critical habit which develops as the chief personal product of research may for the time being act rather as an inhibition than as a stimulus in practical work. But in the long run that critical attitude, the habit of testing all information, all new experiences, by standards of truth and by scientific method rather than by immediate practical results and emotional reactions, is one of the best products of a higher education.

It has been a commonly accepted view now for some years, in response to the warnings to teachers given by a few prominent leaders in psychological investigations, that formal study of psychology and especially psychological investigation or experimentation could have little or no direct value to the teacher, chiefly

because the investigator must take an impartial, objective, disinterested position; while the teacher's attitude must be the reverse of these. The teacher must deal with the child as a personality, and must view the entire educative process as one controlled by personal relationships, not by objective forces. But we have found no substitute for training in psychological observation and analysis which will give the teacher an insight into the problems with which he deals. Probably the "born teacher" needs no such introduction to a knowledge of the child and of method, but the supply of these is not adequate to the demand of our school system.

The tendency indicated by the action of colleges and normal schools all over this country to require the Ph.D. degree as a qualification for professional positions, while it is often carried too far and the form substituted for the thing signified, is an evidence of the general acceptance of the point argued here. The man who has only second-hand knowledge and knows how to obtain only second-hand knowledge is a second-rate man. Unfortunate as the effect of this practice of presidents and trustees may be upon the present generation of teachers, its ultimate effect cannot but be most desirable.

Social value.—While the investigator has ever been loath to mix the work of investigation with the actual work of practical application, even in the physical sciences, yet the devotee of science for science's sake, of investigation for truth's sake, grants that the ultimate purpose is application to life's problems, for his final argument is that the valuable and practical results are more apt to be obtained if the pursuit of truth, the scientific investigation, is carried on with no ulterior end consciously in view. But the great social problems in which education is so important a factor are different from the more or less abstract problems of science in that the problems deal with the relations of human life. The solutions of such problems are not reached until the better readjustment is made.

Hence the third reason for the fostering of research work, and one which more directly relates to our topic for discussion, is the effect on society. The educational world has long realized the necessity of investigation for the influence which it

had in the development of intellectual leaders. Since the time of the Renaissance, work of this kind has been fostered by most higher institutions of learning, in the classical languages and literature. True, modern philological methods date only from the late eighteenth and early nineteenth centuries, but the development of modern views concerning language and philological research were themselves the product of the earlier research work of a less scientific character. In the same way modern critical methods in history and literature in general developed about the same time; but also from the same general causes. With the development of the natural sciences, the general social effect of such research has been more clearly seen and more definitely emphasized from the first. It is upon this general social result, not upon the reaction upon the individual, that Francis Bacon laid so much stress. The great leaders in science from the sixteenth century to the present have seen clearly that advance in intelligence was dependent upon such critical investigation; and from this indirectly, if not also directly, that all social progress could come.

So in technical training in education, the general social outcome constitutes the most important of all the results of research work. Educational progress, so long haphazard or empirical at best, can be secured in any accurate, substantial, and measurable degree by the employment of scientific methods of testing educational tradition, current practice, existing machinery, and proposed innovation. And if this direct social value is to be obtained, it is evident that the work of investigation itself must be more than that of isolated individual effort; it must be co-operative. This call for co-operative effort in research is most pertinent at the present time, for in education, as in every other aspect of social life, the public has taken a critical attitude toward existing practices and institutions and demands that the reasons justifying the continuation of such customs or the costly support of such institutions be made evident. Sane reform, consisting as it must both of criticism and reconstruction, if not of invention also, must be based upon scientific investigation. President Woodrow Wilson, in his recent address upon "The Lawyer and His Relation to the Community," says:

It is the fashion, too, to say, as if with a superior knowledge of affairs and of human weakness, that every age has been an age of transition, and that no age is more full of change than another; but in a very few ages of the world has the struggle for change been so widespread, so deliberate, or upon so great a scale as this which we are taking part in. The transition we are witnessing is no equable transition of growth and normal altercation, no silent, unconscious unfolding of one age into another, its natural heir and successor. Society is looking itself over in our day from top to bottom, is reaching fresh and critical analyses of its very elements, is questioning its oldest practices as freely as its newest, scrutinizing every arrangement and motion of its life, and stands ready to attempt nothing less than a radical reconstruction, which only frank and honest counsels and the force of generous co-operation can hold back from becoming a revolution. We are in a temper to reconstruct economic society as we were once in a temper to reconstruct political society, and political society may itself undergo a radical modification in the process. No age was ever more conscious of its task or more unanimously desirous of radical extended changes in its economic and political practices.

These remarks apply quite as pertinently to the teacher and to education as they do to the lawyer and to politics. For in no respect are the evidences of transition and of social self-inspection more evident than in educational affairs. And in none are inspection, criticism, and improvement more needed; for in few is the control of tradition more general or the ratio between effort and results more disproportionate. As with the political, so with the educational also, these changes are bound up with the economic; but investigation should see to it that in the readjustment, economic and educational are not confused. In the current propaganda for industrial investigation this very confusion is being made; it is just as great an error to approach the entire problem of vocational education from the economic standpoint to the neglect of the educational (as is now being done), as was the earlier attempt in manual training, to approach it from the educational to the exclusion of the economic. Investigation of contemporary school systems and of various phases of the social aspects of education would obviate many dangers toward which we seem headed. And historical investigation would reveal similar problems, similar solutions, and similar dangers. Two generations before the manual-training period, industrial education, then in the guise of manual labor institutions, had a most enthusiastic following. Few

educational projects in this country have ever been as widely adopted. But the entire movement was wrecked since it was based on economic to the exclusion of educational purposes.

Surely in every line of educational endeavor at the present time is the necessity shown for the steadying influences of scientific investigation. And this chiefly, not for its reaction on the individual investigator, nor for its stimulating effect on educational instruction; but for its benefit to society as a whole, as the welfare of society in the succeeding generation depends upon the training of that generation in the present.

TYPES OF METHODS EMPLOYED

Hardly less significant than the general professional purposes of research are the types of methods employed. The consideration of method presents another phase of possible co-operation. As previously suggested, method requires such absolute freedom, that the co-operation demanded is often of a negative character, namely toleration, and an acceptance of other judgments and methods as well as a support of one's own.

The traditional methods of logical investigation which appertained to such scientific study of education as existed in centuries preceding the nineteenth have ceased to receive any great consideration. At the present time the number capable of using such methods with results of any value are so few that they are above the general rule; and the question of co-operative effort hardly extends to them. This statement does not deny that there are many phases of philosophical thought in its relation to the educational systems of the past or to the contributions of the present which are open to investigation. It only calls attention to the common attitude that has rejected—for our own time—the method of introspection, as a means of solution of the actual problems of objective life. A much more serious condition confronts us in the tendency to reject the observational methods of the Herbartian school and of the nineteenth century in general. While this method has served its time, and more accurate methods which are capable of being applied to certain, if not all, of the phases of education considered by the Herbartian schools have been evolved, the

question remains, Is the more recent method alone worthy of acceptance? Under the leadership of the advanced German group, and in general of the influence of experimental psychology on education, there had developed an inclination to deny validity to any other method. This group is strong not only in Germany; it is active in England, and has its representatives with us. The comparative methods, whether the statistical or so-called census method—the American method as it is termed in Europe—or the historical methods of textual criticism and of institutional comparison, are alike rejected. Possibly the appropriation of the term "experimental" need not concern those who use the various forms of the comparative method; but the observational has not yet been so put out of court that no claim to their use of the term exists. What is needed here is toleration. Especially is it true of the two claimants for the term "experimental." The standard by which all could be judged fairly is that of results. Has the newer phase of the experimental method so justified its claim to be the only method of investigation of educational problems, that all others should be rejected? The test should be not alone that of the problems investigated and the conclusions published; but that of the actual truths established, and their final application of such new truths to current educational practice, either by rejection and criticism or by positive contribution.

Possibly this is not a fair test as yet of any one of these methods. But it will be the ultimate test. Karl Pearson has said that fully 50 per cent of all scientific research is worthless and much of it harmful. Possibly the statement could be made stronger for education. Certainly such a judgment has importance for the future rather than for the past, since research work in education by any method has been very slight.

Co-operation which is possible and is needed here lies in the breadth of view and the sympathy which will welcome and encourage any form of study, with professional value, and any form of research which has scientific character and promises some result. It certainly is folly to waste time and energy in decrying a competitive method when the opportunity for experiments is so limitless and the needs for definite scientific answers to problems are so great.

Though it is true that we have the suggestion of the same great scientist previously quoted that what we need is an endowment of an institution for the suppression of unintelligent research, yet it is only out of the variety of endeavor that we can expect in time to select the tendencies which promise the most.

CO-OPERATIVE RESEARCH IN THE HISTORY OF EDUCATION

Finally a few words may be expected from the writer concerning co-operation in research in his own special field.

Opportunity.—Concerning the opportunity for research little need be said. The field is practically virgin. Our educational traditions are accepted without critical evaluation and have been now for many decades. We are wholly ignorant of actual conditions which concern the origins of the traditions which we accept and of the institutions in which we live. Opportunities for research in problems vitally connected with the present are abundant.

In the field of American educational history many of these exist and few have been attempted. The materials relating to these are so scattered and many of them so scarce that co-operation would be very desirable. The origin of our institutions is to be found not in general legislation but in local customs and activities. Yet it is generally assumed that when we have repeated a few general colonial laws we have not only the basis but the essence of our early educational history. The parish and county records of Virginia or any of the southern states offer a most attractive problem for investigation. Existing as these do in manuscript only, and scattered as they are, co-operative effort is essential. The town records of the New England colonies offer many opportunities for such work. Ecclesiastical as well as political records afford excellent opportunities for educational research. Besides the records of individual church schools, both local and general ecclesiastical bodies of such churches as the Friends, the Presbyterian, the various German bodies of Pennsylvania contain such records. The records of the Society for the Propagation of the Gospel in Foreign Parts contain what is practically a history of education, at least a history of schools outside of New England, for the eighteenth century.

The early nineteenth century is no less fertile in materials. Practically no account has been written of the actual development of the free-school idea in any of our states. Such an account would not concern itself so much with the succession of laws, as with the ideas, notions, and actions of the people in so far as they were related to education. The connection between free education and poor laws, between church school and free school, between apprenticeship and industrial education have never been studied adequately. Because of the extent of these any adequate study would call for co-operation. No worthy history of American education can be written until it is attempted in the manner of the *Cambridge Modern History* or of similar works.

If we turn to other fields, similar conditions meet us. Only two or three men have ever attempted to get a real knowledge of English education in the past, through study of the local records. And not very many adequate studies have been made of individual institutions. Here as elsewhere the universities form an exception, since the loyalty of scholarly sons provides for that. Little is known of education in the eighteenth century, even of the large movements. In the general view, Rousseau constitutes French education, Basedow, German, and Locke and Chesterfield, English. The seventeenth century has attracted more attention, with no result more worthy than that of Heubaum. The actual effect of the Reformation movement on education, the actual condition of schools and educational practices in general during the Renaissance can with profit be subjected to far more critical study than has been given. Preceding the period, almost every aspect remains for most of us an age of darkness. In the field of method, the countless suggestions of "new" methods indicate how great a field is presented here. For each has a history, often reaching to the remote past. No problem connected with the curriculum can be adequately solved without sufficient historical study to indicate its social connections and significance. All these fields not only offer opportunity but call for co-operation.

The need.—The need for research work in general has been emphasized in a previous section of this paper. What was there said concerning the reflex influence of research work on educational

activities of whatever grade, and the influence on the student himself, applies with peculiar force to research work in history. No other phase will so tend to broaden one's views and to give better perspective. One danger of many phases of research work is that it so narrows the student that it results in putting the entire subject out of focus. Historical investigation, dealing as it must with those variable factors of human volition which experimental work must seek to eliminate, necessitates focusing the attention upon human motives and actions in their natural relationships. The power of appreciation of the total human or social situation, so essential to the teacher, is cultivated not atrophied by such specialized study.

The need for investigation of a historical character is indicated by the fact that practically all of our educational customs, even those relating to method and hence essentially psychological, can be fully understood in their present form only through the historical approach. Such popular movements as that of industrial education would be far more effective if the leaders in the movement were informed of the course of similar movements in the past, of their partial nature which has caused their failure; of the obstacles which they have met; of their relations to other social and educational forces. In fact, historical investigation needs to be combined with contemporary, comparative study to make effective the evaluation of any existing or proposed educational procedure. It may be granted that without the assistance of present sociological investigation any historical study cannot possess that highest value to be expected of research work that was emphasized in the earlier portion of the paper, namely, its application to social betterment. On the other hand, no such contemporary study of administration or other educational conditions which lend themselves to statistical or observational investigation can be complete without the accompanying and preliminary study of origins.

As indicated in the discussion of types of method, it is evident that the experimental method, from which in the present day so much is expected by its devotees, and so much desired by all, is applicable only to certain groups of educational problems. The school of investigators, best represented by Meumann, tends to

deny the validity of the use of the term experimental by the observational school. Since practically all advance in the past has been brought about through empirical efforts unscientifically checked, and the marked advance during the nineteenth century was the direct outcome of the same observational method scientifically formulated, we are hardly yet prepared to discard the attempts in this field until stronger reasons are adduced than have as yet been brought forward. It is further apparent that essential aspects of education can be dealt with only by other methods including the historical. Any problem concerning the aims of education, such as the traditional liberal or disciplinary aims, can be clearly understood only in the light of historical investigation, though such investigation may not definitely settle such questions for us in the present. Problems of the curriculum are similarly without the scope of experimental methods, unless the observational are included under this term. Problems of organization and of administration, of social relationship, and of functioning—all depend for solution upon the use of various methods. To the solution of each of these problems the historical must contribute its share. Here is the highest and most essential form of co-operation: that of students trained to use their own particular methods, working on the same problems from different points of view. What is needed is mutual help and scientific toleration, not intellectual snobbery.

Co-operation in research is made possible now by a number of factors. Publishers are willing and anxious to bring out the product; the professional public is clamoring for light; men of wealth are willing to assist in any such effort that promises to be of value; and scientifically trained students, interested in education, are more abundant. Truly a decade of the future should show greater results than have generations of the past.

QUANTITATIVE INVESTIGATIONS IN EDUCATION: WITH SPECIAL REFERENCE TO CO-OPERATION WITHIN THIS ASSOCIATION

EDWARD L. THORNDIKE
Professor of Educational Psychology, Teachers College, Columbia University

A proper report on this topic could be made only after a quantitative investigation of the topic itself. Only after one had measured the benefits resulting from different kinds of researches and different ways and means of co-operation in research by college teachers of education, would one be able to speak with full authority in recommending what problems should be attacked and what methods adopted. I have long desired to measure the contributions to knowledge about education made in this country by teachers of education, by psychologists and sociologists, by our supposed educational leaders, the presidents of universities, and by those school officers whose salaries are such as might justify the expectation that they would be experts in educational theory and practice. If the contribution of each man could be studied in connection with his inborn talents, the nature of his training, the facilities which society provided him with, and other relevant conditions, we might hope to direct and assist more rationally both the selection and the treatment of the individuals who have in charge the most practical feature of education—that is, the advancement of knowledge about it.

I regret that lack of time and means has prevented this, and that this report must have only such validity as comes from personal experience and observation of quantitative work in education and of co-operative endeavor in securing and utilizing measurements.

The first fact to note is that quantitative work is possible in every one of the lines of thought about education represented in this association. We have come naturally to classify our problems as those concerned with (1) the *material* or *subjects* or *individuals*

to be changed or educated, (2) the *aims* of education, or the nature and amount of the changes to be produced in these individuals, (3) the *agents*, teachers and others, (4) the *means*, buildings, books, laboratories, and the like, (5) the *methods* by which these agents use these means, and (6) the *changes resulting* from each combination of agents, means, and methods acting upon each kind of individual educated. To every one of these six problem-groups quantitative methods of investigation are relevant. "The mind" of the older analytic psychology was only an average or modal condition each of the deviations from which needs to be known in its exact degree as well as in its direction. Indeed that average or modal mind can be usefully thought of in detail only in terms of amount. The aims of education, if they are to descend from the upper regions of verbal generalities to live and act in the practice of schools, must be defined for each person to be educated as so much of this knowledge, so much of that power, such and such surety of these habits, such and such strength of those ideals. The actual aims of any institution must also represent a balance or compromise among many goods. It is: *How much* knowledge may we sacrifice to health? *How much* efficiency in earning a living must be sacrificed for *how great* a gain in those qualities which have not yet a value in exchange?

For those who will read this paper it is needless to continue and show that for both theory and practice we must investigate in the case of the teacher *how much* experience in teaching, *how much* professional training, and the like; in the case of the means, *how much* of this or that subject-matter or material apparatus; in the case of the methods, *how much* of time, repetition, illustration, motor expression, and the like.

One may primarily be interested in the student body, in the teaching staff, in the curriculum and material plant, in the receipts, in the expenditures, or in the community's aims from which all these arise. He still will find abundant reasons for quantitative investigations, if interest, capacity, or a sense of scientific duty impels him thereto.

A second fact to note is that the number of useful studies to be made is, for all practical purposes, infinite. An educational survey

of one state would seem to be at least as elaborate a task as a geological survey of a continent. The educational life-history of one boy would certainly demand as much time and skill as the biological history of the ants or bees. The results produced eight years hence in the children who entered the New York City schools this fall offer a problem more complex than that of the results of the contraction of the earth. What physical science has to do in comparison with the cosmologies of the early philosophers, the science of education has to do in comparison with the first generalizations of Herbart, Spencer, or Dewey.

A third fact to note is that the quantitative work to be done is in one respect very easy and in another respect beset with extraordinary difficulties. This matter is perhaps of special importance because our failure to advance knowledge about education as rapidly as we wish is perhaps due in large measure to oversight of certain specially favorable facts and blindness to the special difficulties.

What makes quantitative work in education easy is the ease of securing material. Any town would provide this entire society with matter for study for all our lives. We need not wait for comets, nor travel to mountains, nor pay for rare earths, nor construct elaborate apparatus. Although expensive educational laboratories, museums, clinics, hospitals, experimental schools, expeditions, and the like are of very great service, no one of them is a *sine qua non* in the present state of the science.

What makes quantitative work in education hard is (apart from the difficulties characteristic of the solution of all original problems) that it deals with facts of human nature and behavior. Complexity, variability, and the absence of proper units and scales of measure are the three great difficulties. For example, so apparently a simple educational achievement as knowledge of two-place column addition involves, besides the forty-five fundamental associations and their reverses, at least nine distinct habits or processes. No one of these is constant in its behavior. Hence each must be measured many times in each individual. And, even in these least difficult of educational measurements, the worker is unprovided with units by which he may measure two children

so as to assert without fear of contradiction that one has achieved twice as much knowledge of addition or twice as much power to add as has the other.

To state what provisions must be made in view of the complexity, variability, and lack of units and scales which characterize educational facts, would imply a long and technical account. As nearly as I can suggest the facts in a single sentence, the complexity must be endured, the variability can be overcome by modern statistical technique, and the lack of units and scales is to be remedied by special investigations.

Such special investigations, aimed to secure units of measure which shall be to educational facts what the foot, pound, degree, volt, ampère, and the like are to physical facts, are peculiarly appropriate for consideration by this association. They should be of general interest because they are to serve the purpose of investigators of educational achievement of many sorts and from many points of view. They are also peculiarly favorable for co-operative effort. We may therefore consider them first.

We may roughly divide scales of measure into five groups. The first includes those scales whereby the object to be measured is judged to be equal to some defined fact. Thus a child might measure a bush as "as tall as my dog" or "as tall as my father." Thus we used to measure a temperature as that of "boiling water" or that of "melting snow." Thus we measure a pupil's ability to read as "that of an average third-grade pupil" or his penmanship as "a good plain hand."

The second includes those scales whereby the object to be measured is judged to be equal to some definite fact which is defined *by its difference from some still more primary fact.* Cases of this second sort would be for a child to judge a bush to be "two kittens" or "two kittens and a mouse" taller than "a dog," or for us to rate a pupil as knowing "what the average ten-year-old knows plus two times the difference between the average ten-year-old and the average eleven-year-old."

The third group includes the scales whereby the object to be measured is judged to be equal to some definite fact which is defined by its difference from some still more primary fact, *this difference*

being expressed in terms of multiples of some one amount or unit. The money scale is an illustration.

The fourth group includes scales like the second but with the additional feature that the fact of ultimate reference is *an absolute zero* or just not quite anything of the fact in question. The thermometer when reduced to degrees above -273° C. is the best illustration.

The fifth group includes scales possessing both the equality of units of group 3 and the absoluteness of the zero of group 4. The common scales for length, weight, and time are typical examples.

Our ordinary descriptions of the degree of knowledge, power, interest, and the like of a pupil, and, in the main, the scores we give in psychological tests, the common-school gradation, A.B. degree, and all similar official marks, grades, and distinctions, obviously represent scales of group 1 or 2. The ideal to strive toward is obviously a set of scales like those of group 5.

Far greater progress toward this ideal can be made than we commonly realize. It cannot be expected that experts will agree as closely in respect to the equality of two differences in, say, merit in English written composition, as they will in respect to the equality of two differences in length. The construction and the use of a foot-rule for, say, merit in English composition will always be attended with larger errors than will be made in making or using a foot-rule for length. But if there is any validity in our judgments that, of four passages, A, B, C, and D, A has more such merit than B, and differs in merit more from C than it does from B, then a scale for merit in English composition by which to measure amounts and differences in merit as multiples of some one unit can be constructed that shall possess the same degree of validity. And if there is any validity in our judgments that passage D has zero merit or less than zero merit as a written composition by a boy in his teens, then a scale for merit in English composition can be constructed whereby, with that degree of validity, we can measure the merit of a piece of English writing as so many units from zero merit in just the same way that we measure a stick as so many inches longer than zero length. Such a scale and its units

will be, to present means of rating educational achievements, just what the modern objective foot-rule is, to the counting of thumb-lengths or hand-spans. The use of such scales is obvious. They are least needed in the use of arithmetic. But even there, had proper ones been in existence for various arithmetical abilities, Rice, Stone, and Courtis could all have used them, with resulting economy of time and comparability of results. Moreover, any school officer of scientific temper and common-sense could compare the work of his school with all the work measured by Rice, Stone, and Courtis. They are needed for the estimate of inner mental growth or maturity as well as of educational achievement. Processes are known only by their products. They are needed even more for changes than for static conditions. To prove a change in any pupil in any trait one must measure him at least twice in respect to that trait, and for the proper measurement of any trait the first essential is a proper scale. We cannot think of any fact of "how much" without a scale. The question is whether it shall be like the child's "as tall as my father," or like the physicist's "x times the wave-length of cadmium light."

A further reason why the construction and improvement of scales whereby to measure educational forces and educational results is appropriate work for the members of this society is that the work often requires many expert opinions of the value of this or that educational product and of the amount of this or that educational force. Take, for example, the case of a scale for merit or ability in written expression in the vernacular, by young people in their teens. We desire as our scale a series of compositions ranging from those of very little to those of very great merit, differing from one another progressively by equal steps and defined each by its difference or distance from some composition agreed upon as of approximately zero, or just not any, merit. Merit as writing by an individual of eighteen is to be defined by the consensus of the best judges. We need to have hundreds of sample compositions graded by a large number of experts in education, expert literary critics, men of general wisdom, experts in knowledge of boys and girls in their teens, and expert teachers of English composition. The members of this society would them-

selves be the experts in education and could secure the aid of the other groups among their colleagues and professional acquaintances.

In so far then as this society is to recommend lines of quantitative investigation in education to its members, I suggest, as one of these, the discovery of units and scales for the measurement of educational facts, of educational causes and effects, of the different features of staff, plant, and curriculum, and of the different changes produced in the student-body thereby.

Among the thousands of quantitative problems to be solved with the aid of proper units and scales, as fast as the latter are obtained, it is probably unwise to single out any as peculiarly worthy of our attention.

The interests and facilities of each individual thinker guided by the knowledge of each year's output of scientific work in education will probably secure a truer, healthier, and more fruitful co-operation in the long run than any formal arrangement and assignment of tasks. At any rate, it is not to my taste to make any announcement of what the members of this society should study. In selecting for mention certain problems, my aim is only to show samples of the countless opportunities. A dozen other equally good selections might well be made.

In the case of the material or subjects of education—the student-body—it is enough to remind ourselves that the original equipment of instincts and capacities which is the starting-point for education is known neither in the case of the typical representative of *homo sapiens* nor in the case of the equally important deviations therefrom; that the interrelations of mental capacities have been determined in only a very few of the countless cases; that the changes, year by year, due to mere inner growth apart from all education are largely unknown; that the physical, psychological, and sociological conditions of pupils as they actually come to us in grade 1 or grade 7, or as college Freshmen, are known only crudely and vaguely; that, in fact, for any individual, the natural history apart from education and the educational history are alike unknown. The concrete details of human nature and its infinite varieties wherever describable are also measurable. The changes in mental

traits and the relations between mental traits have been but recently studied by psychologists and are especially appropriate for study by a student of education who is also a psychologist.

In the case of the agents of education—the teaching-staff—it will be of special interest to measure the relations of sex, age, degree, and kind of scholarship, amount and kind of professional training, success therein, health, various physical characters, professional interest and zeal, salary, permanence of tenure, amount and kind of supervision, and the like—each to results achieved. The first steps taken by Meriam, Strayer, and Ruediger with such inferior data, and by such crude methods, as were available, should encourage us. The need of research I may illustrate by two widespread opinions which I imagine most of us would judge to be exactly the reverse of the truth. The first is that ability in teaching is inversely related to ability in advancing science; the second is that increasing the academic and professional requirements for teaching will increase the proportion of men in that profession.

In the case of the means, methods, and results of education, we have begun, in studies of the learning process and comparisons of the achievements of different school systems, a sort of quantitative work which deserves enormous extension. We may expect much from measurements of results attained when different methods are used by the same agents working with the same subjects and means; when different means are used, the agents and subjects remaining constant; and so on.

The most instructive measurements will naturally be those of the results of an application of the educational force in question over a long time and under fully controlled conditions. But far less elaborate studies will be of value. The effect, upon the pronunciation of a foreign language, of preventing the pupil for the first month from pronouncing any word until he has heard it pronounced by the teacher, can be measured within two months' time. The results (1) from leaving the addition combinations with higher decades to inference (e.g., from $7+6=13$ to $17+6=23$, etc.), and (2) from the special acquisition of a dozen or more of the higher decade combinations, as habits, can be usefully compared

after only a month's experiment. The same is the case with hundreds of problems in school practice.

A crude, but very convenient, way of estimating the agents and appliances devoted to any individual's education is by the money-cost of the latter. The studies by Elliott and Strayer represent here the preliminary trials of material and methods, which should be extended in many directions. We know that in general the cost of high-school education is roughly twice that of elementary education, but we do not know the cost for each grade separately, for gifted compared with dull pupils, for well-intentioned compared with ill-intentioned pupils, for a course in chemistry compared with a course in beginning Latin, for collegiate and graduate instruction, and the like. Yet each of these questions is unanswered only because of lack of sagacity or effort. Those of us who are interested in fiscal administrative problems can be as scientific as the experimentalists. Even so immediate a problem as the analysis of a college's expenses into a proper cost-account has as yet been done only speculatively.

Again, a crude, but very convenient, way of estimating the attitude of society toward education is by the sources and motives whence the educational receipts arise. How much is spent in a city for tuition in private commercial schools? By whom? Why? How much is received by higher education from society acting through the state? How much from individuals privately? Why is the proportion so different in Germany? How has the proportion changed in the last thirty years? What is the exact order of attractiveness of educational appeals to a state legislature? How has this order changed? The receipts account is the simplest fact of record in an educational institution; yet it offers abundant opportunity for quantitative study.

The same richness is obvious if opportunities are classified not under the subjects, agents, means, methods, and results of education, but under the units in which educational facts appear in practice. Each pupil, class, school, community, subject of study, textbook, library, museum, county, city, calls to mind conditions, changes, and relations that need to be measured. I am told that there are college teachers who never use a book from the library!

How many are there? I should like to know how many library books in French and German are read by young men and women of American parentage who have studied these subjects for one, two, three, or four years in the schools. Is Stanley Hall correct in his suggestion that boys of a certain age prefer popular magazines on applied science, such as the *Scientific American*, to the ordinary stories of adventure? These are samples of scores of quantitative problems each needing solution in many communities, that are suggested by only one of the educational units.

Finally, there is, at present, abundant opportunity for quantitative work with facts observed by others, and recorded more or less satisfactorily in school archives and printed reports. The archives of certain schools undoubtedly contain data on age at entrance to school, promotion, retardation, and elimination that will be, though inferior to individual educational histories recorded deliberately year by year by a scientific expert, well worthy of study. I know from experience that the printed school reports of the last half-century, in spite of laborious ineptness in their statistics and scientific irrelevance in many of their details, contain trustworthy observations of facts for the present which no scientific expert is collecting independently, and similar facts for the past which no one could now collect. This I know to be the case for salary, education, and experience of teaching staff; nationality, age, previous training, social position, degree of self-support, and later life-work of pupils; and subjects, textbooks, and examinations of the curriculum. I infer it to be the case with other facts of importance.

It is inconceivable that, for any individual or group in this society desirous of undertaking quantitative investigations in education, there should be the least difficulty in finding work that can be done and is worth doing.

We may turn therefore to the question of methods of securing and using measurements.

In securing measurements the general principle should be to have the one who is to use them make them or at least know just how they are made. Data obtained by deputy are inferior, and if the deputy does not work under the entire control of the investigator, they are very inferior. It is possible so to organize the work

of testing children, collecting data from school records, questioning teachers and others, and the like, and so to train assistants to do it, that one investigator may be working over facts collected by many hands. There is, however, a psychological limit to the increase of scientific achievement by the employment of assistants. The most efficient organizer and manager of scientific work of my acquaintance once said: "If you want to do twice as much work, get four assistants; if you want to do three times as much, get sixteen assistants; if you want to do four times as much, *you can't.*"

One vice of statistical studies in education today is the indiscriminate use of lists of questions as a means of collecting data by correspondence. There is, it is true, a real need and a justifiable use for questionnaires. When they are answered by individuals whose testimony is valid as evidence, who have answered them in connection with explanation and cross-examination, and who are under some claim of friendship, payment, or the like, whereby the investigator has a right to their time and effort to the extent involved, they are justifiable. When the facts can be got best through the utilization of knowledge of many individuals, they are needed. But any one of us is likely, in the case of a topic which he is investigating, to overestimate the claims he has on the time of school officers as a representative of science; and many of us, I fear, do not realize the general inferiority of the testimony of even gifted men and women to the direct observations of a specially trained investigator who knows the exact bearing of the facts on the problem.

Certain precautions are obviously necessary. The first is, other things being equal, not to trouble people with printed questions. A general prejudice against them is healthy, for the natural tendency is to over-use them. The second is to study first by direct observation any topic which is to be studied later by means of a questionnaire. One thus gets acquainted with the difficulties others will have in observing and reporting the facts in question, and can in some measure provide for them beforehand and allow for them afterward. The third is to remember the distinction between testimony and evidence. The fact that a pupil writes that he

likes to read Milton is his *testimony* that he likes to read Milton. It is *evidence* that he really does, or that he thinks that he likes to read Milton, or that he thinks Milton is an author, liking for whom is the proper thing, or that he mis-heard "Milton" as "Bill Nye," or that he is a liar, according to other facts which are known concerning him. The answers of all sorts of individuals to all sorts of questions are proper material for science, but the last thing in the world to be done with most of them is to accept them as valid evidence of the truth of what they verbally state. The fourth is to combine with any question, demanding more than the very simplest report of very objective facts, a personal cross-examination of the reporting individual. The fifth is to make some fit return for the time and effort of answering the questions. We must be sure that we act as the servants, not the "bosses" of science.

As was suggested in another connection, much can be done by the aid of facts copied from school archives. Such copying should, when possible, be done by a trained assistant of scientific ability who knows what is to be done with the facts. When done by the school authorities, it should be paid for, though not necessarily in money.

In all cases, either of direct observation and experiment or the use of facts collected by others, there are two further principles. First, any variable fact to be measured should be measured at least twice, so as to allow estimate of the measurement's reliability. Second, to measure a given number of pupils, teachers, or institutions with respect to one item is not nearly so profitable as to measure the same number of items about the same pupil, teacher, or institution. The latter gives an equal amount of descriptive fact, and, in addition, valuable knowledge of changes or relations. For example, suppose 1,000 pupils to be measured with respect to "grade reached before elimination from school," and, on the other hand, 100 pupils to be measured, each with respect to (1) grade reached before elimination, (2) age at entrance to school, (3) number of absences per year, (4), (5), and (6) intellectual ability by three mental tests, (7) interest in school work, (8) father's wage, (9) grade reached before elimination by older brother

or sister, and (10) pupils' occupation three years after leaving school. By the latter procedure, data are secured allowing the calculation, if they are well chosen, of forty-five important relations between single traits and hundreds of relations between complex traits.

Economy and protection against fallacies in using educational measurements are secured by knowledge of the theory of measurements of variable facts. The arithmetic of the primary school and grocery store is not adequate for the treatment of our problems. Mastery of certain elements of statistical method would halve the labor and double the product of the investigations of almost all educational bureaus and officers, and of a large majority of individual workers. Quantitative work is improving very rapidly in this respect, and, for this society, I need only mention, not defend or illustrate, the need of the individualizing method in the use of facts, changes, and relationships, and of measuring variability and reliability as well as central tendencies.

One corollary of the individualizing method is, however, of so great importance and so rarely applied in practice that I shall specify it. It is that in publishing the results where several facts for each individual (person, institution, or other natural unit for study) have been measured, the publication should include the individual scores. This seldom requires an addition of more than one-fifth to the expense of printing, and enables all critics and investigators to utilize the material for any purpose. If the printing does add too much to the expense, the individual scores should be deposited in some library and arrangements made for the sale of copies. Even the best workers in psychology and education have been incredibly careless in this, and I am glad of the opportunity to plead that every member of this society take pains to teach graduate students, by example and precept, to publish, in all cases where a number of individuals (persons, classes, institutions, or what not) are measured in a number of traits, a list of the individuals with all the measurements of each.

We are now in a position to ask what can and what cannot be done by co-operation in quantitative investigations by such an

association as this. It is best to discuss certain general matters first and then perhaps formulate some definite practical proposals.

First let me make a distinction between co-operative and communistic research. By co-operative research I shall mean research made by each, with awareness of, interest in, and helpfulness toward, the work of others, but controlled by either individuals or groups. By communistic research I shall mean research controlled by associations, majority opinions, or committees under the control of the scientific community in question. The distinction is roughly that between *free* and *forced* co-operation. In view of the history of science and the psychology of scientific men, the distinction is for this society also roughly that between *natural* and *artificial* co-operation.

Co-operation in research we have in large measure already. The way to increase it is in general for us to print results promptly, make frequent reports of progress in our researches, meet for discussion and criticism, read the reports of each other's investigations, give financial support to the journals which print them, keep each other's work in mind, and give assistance in the way of information, encouragement, and natural aid, so far as it is right for us to do so. When each man acts as he thinks best for what he considers the advance of knowledge rather than for his own comfort and repute, there results a true, a natural, and perhaps the best form of co-operation in investigation. In spite of anarchy as to control, there is harmony and efficiency in action, and unity in the result.

Communism in research, with joint responsibility, joint action, and joint rights in the achievement, seems unlikely to be successful except in certain very definite tasks, hardly to be called investigations, like taking a census of students of education in colleges, deciding on technical terms, and the like.

An attempt by the society to investigate any important problem communistically would, it seems likely, lead either to oligarchy or to heroism! That is, either a few men would direct our labors, we acting substantially as their scientific servants, or the investigations undertaken by the community would be neglected by most of us and carried on by the conscientious few, who would have

done better work without the community's action and who are deprived of their meed of credit. An oligarchy in investigation would have much to recommend it, except for two facts. The men who would be fit to order us about in our researches do not wish to, and the men who need to be driven by a ruler will not obey. The silent heroism which gives up its own ideals in order to fight in a war for which it did not vote is sentimentally admirable, but out of place in rational scientific endeavor. There is no proper glory in the achievements of a committee whose members would have done better work had they been left to their individual interests.

It appears, therefore, that in general the common action of an association like this should, in the case of investigation, be rather toward the encouragement of natural co-operation than toward the actual undertaking of investigations as a common task. There are, however, certain very definite tasks which might thus be undertaken, one of which concerns quantitative studies and will be described later.

The next general matter concerns a second distinction, between two methods of improving researches in education. The first is by the arrangement of matters beforehand so as to provoke investigation; the second is by rewarding afterward him who does useful investigation.

This society might, on the one hand, suggest or request that certain work be done or, on the other, give attention, esteem, gratitude, and the like for similar work that *had been* done. We might, for example, somehow induce certain workers to take up the analysis of the process of reading, or we might, somehow, honor the studies on eye-movements made by our colleagues Dodge, Huey, Dearborn, and Judd. The distinction is roughly that between the origination of variations and their selection.

It is my opinion that professional and scientific organizations tend unduly to neglect the second method, which has certain great advantages. How to prearrange circumstances so that men will do more and better work in advancing knowledge is a very delicate question; the means taken may, and often do, produce far from the desired result. But there are no such risks in the selection of desir-

able variations after their appearance. Moreover, rewarding, after the fact, the investigations which have been made, seems, from present knowledge, to be itself the best means of stimulating other investigations. The chief means, in my opinion, by which this society can encourage investigation in the future is the treatment it accords to the investigations that have been and are now being made. Our surest means of co-operation for the advance of education is to perpetuate those tendencies which are actually known to have advanced it.

The third general matter concerns some special difficulties in the way of co-operative research by this society. We possess of necessity a great diversity of interests. Bound together only by the facts that we are teachers of education in higher schools, and that we are interested in the advance of knowledge of education and of wisdom in its management, we have by no means the community of technical knowledge and exclusive interests of many scientific societies. Some of us (the writer at least) are grossly ignorant of present researches in the history of education; some of us care as little pragmatically for methods of teaching beginning arithmetic as for Hebrew inscriptions; many of us, I am sure, are bored by statistical tables and methods of measurement. Some of us have no hope of finding time, after administrative and classroom duties are done, for original investigations, and some of us would prefer to devote such time to receptive rather than productive scholarship.

We number historians, sociologists, philosophers, psychologists, administrative experts, and students of methods of teaching. Education itself is a theory, an art, a business, and a gospel, as well as a science. Of the problems for quantitative study from which I chose samples almost at random, there would probably be not one which would command the zeal of all of us. And the same, to a less degree, would hold true of all other specialized, matter-of-fact problems, capable of profitable attack and solution.

If this society decreed that we should annually make a digest of the changes in the by-laws on education of the school boards of cities of 8,000 or over, similar to the admirable digest for state legislation made by Elliott, letting each member be responsible

for a score of cities, the experts in administration would perhaps be pleased, but the philosophers would balk. If by chance the early pages of this paper converted a majority to enthusiasm for the study of educational units and scales, so that the construction of, say, a scale for ability of eighth-grade pupils in spelling was voted to be the task of the society for next year, the historians would default or secede.

A second difficulty is the geographical one. Co-operation is possible in England, in France, and even in Germany, to an extent impossible for us. London and Paris being true leading cities, and the distances what they are, men can work together as they cannot where there is no one city retaining near it or strongly attracting to it all men of science.

On the whole, then, we should be very careful in any proposals for formal co-operation by the members of this society in quantitative investigations. Hasty adoption of any ambitious scheme that seemed plausible would soon bring co-operative effort into disrepute.

My suggestions for communistic effort are therefore only the following: First, an effort to collect for present and future use printed reports, school records, and pupils' work. Second, an agreement to subject the preparation and distribution of questionnaires to thoroughgoing control. Third, an agreement to publish the results of measurements in such form that variabilities, reliabilities, and relationships can be calculated therefrom. Only the first of these proposals requires comment.

All printed reports of city superintendents, courses of study, catalogues of colleges, high schools, and normal schools, proceedings of educational associations, reports of special committees, librarians, and directors of museums, alumni catalogues, and the like should be preserved for present or future use. School archives that record valuable objective facts in the educational life-histories of individuals should be preserved in large numbers, say to include 10,000 individuals per year. Samples of the actual achievements of school pupils—their examination papers, when such are known to be honest tests, their achievement under outside tests, samples of their compositions, drawings, laboratory notebooks, and the like

—should be preserved. Samples should be had from schools of many kinds; 200,000 samples annually representing the work of 10,000 pupils would not be too many.

It is obvious that not all universities can make annually such a collection. Nor can any one university. The effort was made at Teachers College, Columbia University, but the task was too great. The material for use in educational research can be preserved only by a very large fund, or by co-operation. The co-operation involves no sacrifice. If the universities in each state did the work for the schools of that state, the result would be a series of effective collections, far superior in almost every case to the miscellany that now drifts into the library by custom. These collections should all be made in duplicate. One set could then be kept for local use and the other be used by all students of education in common, the student being sent to it, or that part of the collection which he needed being sent to him. At the present time, with competition, each institution tries to make an independent collection of this sort; the files are incomplete; the material is uncatalogued; and the collection is of little use locally and of no use to students of other institutions, all of whom possess about the same miscellany. With co-operation, each institution would have a first-rate special collection, and a share in a total collection of educational sources such as now exists nowhere and could not for any past decade be obtained at any price.

It will be understood, of course, that each institution is free to collect, and is expected to collect, a general reference library of school reports, catalogues, and the like, in addition to this co-operative collection.

It is unnecessary to emphasize the value of such a collection to investigators of education. Consider what it would mean to have now a complete collection of all printed documents relating to educational work from 1860 to 1900, with also ample selections from school archives and pupils' work throughout that period! It will be well, however, to consider two objections to this proposal for co-operation by our society.

First, it may be objected that this work belongs properly to the librarians, not to the departments of education. The answer

is that they cannot do it. Their help should of course be sought, but they do not know the school officers who must be prevailed upon to send the printed material; they would be without means of telling what data to have copied from school archives; and they would be entirely at a loss in getting samples of pupils' work. The collection is, in fact, not so much a library collection as a collection of laboratory material. It must be initiated and in large measure directed by experts in education.

The second objection is that the work entailed is too great. This is in a sense true. To gather school records and pupils' work under proper conditions, and catalogue all, with such statements of the exact conditions under which it was obtained as will insure its proper use fifty years hence, involves, even for a fraction of one state, a very considerable task. And it may be that the collection of printed source-material is all that could be absolutely guaranteed. This alone would be well worth while. But it seems likely that financial aid could be secured for a purpose so attractive to local pride and so immediately practical as the maintenance of an adequate representation, year by year, of the actual life and achievements of the schools. Moreover, in another sense this objection is irrelevant. All that the proposal calls for is that we devote the same time and money, or even a fraction of it, now spent in competitive collection of the same material, to co-operative collection.

It has already been suggested that the more important form of co-operation is the natural working together which comes from knowledge and appreciation of the work of other investigators and from regard for the advance of knowledge rather than personal comfort or repute. Sometimes the best way to co-operate with a man of science is to leave him alone. Sometimes severe and direct criticism will be his best aid. In general the work that a competent thinker chooses to do as a result of his own ideas of what is for the advance of knowledge will help other investigators more than work done at their special request would. We should, perhaps, also feel freer to ask and freer to refuse favors. It has often been the writer's experience to reject a plan for research because its prosecution involved asking two or three hours' labor by each

of a score of experts in education, whom he was unwilling to trouble to that extent. If we could establish it in our scientific code that it was no discourtesy to refuse such requests, we might more freely make them.

In the essentials of co-operation expert students of education in this country are now well off. Free from scientific feuds, jealousies, and bigotries, we are ready to welcome every addition to knowledge and to esteem him who makes it. The only practical recommendation to be made is that we maintain and increase our zeal for the truth, the unselfish search for which brings into a rational harmony the multifarious labors of all.

There remains finally the removal of a possible misapprehension. The topic assigned to me has of necessity made the general tone of this paper that of a plea for original investigation in general, and investigation of a quantitative nature in particular. In making such a plea one is likely to leave the impression of undervaluing receptive and critical scholarship and efficiency in managing educational affairs by wise control of men, money, and opinions. This paragraph is to remove that impression if it has been made upon any reader. It is no more the duty of all educational experts to make original contributions to science, much less to quantitative science, than it is the duty of all to be clever teachers, erudite students, and great managers. For any one of us to leave the activity in which his nature makes him efficient for the common good and fly to others that he knows not of would be both unscientific and unco-operative.

BRIEF COMMUNICATIONS FROM MEMBERS

WHAT CORRELATIONS ARE THERE BETWEEN THE CHANGING INCREMENTS OF PHYSICAL GROWTH AND SCHOOL STANDING IN THE SAME INDIVIDUAL? IN DIFFERENT INDIVIDUALS?

BIRD T. BALDWIN
Department of Education, University of Texas

There has been much speculation and advice in regard to this complex problem, and anything like a detailed and accurate answer is apparently impossible from our present available data. Since education has now passed beyond the purely speculative and deductive methods on the one hand, and the scattered empirical observations of the schoolmen on the other, and is rapidly developing as an experimental science, the great need with which we have come face to face is for more usable facts—facts which may be arranged serially or chronologically in order that the history or development of given phenomena may be traced.

In order to determine the correlations suggested above, two subproblems require further investigation. First, more uniform methods of evaluating school standing into forms which may be used from year to year by different teachers are necessary. (A good start has been made in this direction by Cattell, Thorndike, Dearborn, Meyer, and others, and the "mental tests" of Binet and his many colleagues will later throw much light on the correlation of school standing and general intelligence.) Secondly, we must have the community of interests of teachers and of our directors of physical education in order that we may know more about *how* children grow. There is great need for more usable data in anthropometric measurements; that is, a long series of consecutive measurements on the same groups of individuals, by the same examiner, at regular six-month intervals from the child's birthday, with a uniform unit of measurement used throughout. No

statistical results can be more accurate than the measurements on which they are based, and to subdivide units when working out results is simply to increase the errors.

The correlation of changing increments of physical growth and school standing is an important complex problem requiring co-operative research in experimental education, and any accurate results tending toward a solution will also aid in a more rational interpretation of the relation between physical defects and school standing.

STUDIES OF TEACHERS' TRAITS

H. E. BENNETT
Professor of Philosophy and Education, College of William and Mary

The study of the application of physical and mental tests to the selection and supervision of teachers, while depending upon the further development of the psychology of individual differences, would give direction to that development and secure the co-operation of educational and psychological forces, with immediate practical returns to each group as fast and as far as results may be attained.

Procedure: (1) by questionnaire addressed to experienced superintendents, arrange a tentative *schedule of "points"* or *traits*, desirable or merely differentiating (dare I say after the manner of stock-judging?); (2) compilation of signs or *indications of such traits* as (*a*) recognized by experienced supervisors or "judges of human nature," (*b*) recorded observations, (*c*) laboratory tests; (3) similar (*a*) opinions and (*b*) records of *effects of such traits* in the schoolroom, regarded as teaching values; (4) like data as to effects of each type upon various child types; (5) formulation of resulting conclusions or problems, to be assigned to psychological or pedagogical laboratories for experimental verification. Normal-school classes may be the best laboratories for experimental type studies; (6) records of tests and results to be kept by superintendents for each individual teacher.

Unscientific conclusions of this sort are now the basis of selection, assignment, and supervision of teachers. Making these available for all is alone worth the investigation. A scientific basis would go far toward making expert supervision a profession. Teachers should welcome a definite basis of self-correction and supervisory assistance. Typical differences in teachers and relative differences between types of teachers and children have a very obvious bearing upon the availability of proposed methods of instruction and discipline. As a mere type-study, the material will be more satisfactory than unformed children, and expert supervisors are in better position to make the records than classroom teachers of less technical or psychological training.

EXPERIMENTAL STUDIES OF THE NEGRO

W. W. CHARTERS
Dean of the School of Education, University of Missouri

This problem is a decidedly important and fertile one, because it has almost direct connection with pressing educational problems, because very little work of a scientific sort has been done in this field, and because there are no extraordinary technical difficulties to be overcome.

The usual psychological tests could be made upon memory, upon the range and degree of attention, and upon the effect of distraction upon association, upon imagination, etc. Other tests tending to determine the range and nature of the Negro's information and the accuracy of his powers of discrimination and report could be made. Some comparative study of his aesthetic and emotional nature and of his moral and religious ideas might be attempted. In addition to that, he could be tested for ability to get ideas and to form motor habits.

It should be an easy matter to secure the co-operation of the psychological departments in the various colleges and schools of education in southern universities or in northern universities which have Negroes in considerable number in their immediate neighborhood. Missouri is beginning such work under Professor Pyle in its department of Educational Psychology and would be glad either to meet in conference the men of other institutions, or by correspondence to arrange plans for dividing the problem and prosecuting the work.

CO-OPERATIVE RESEARCH WITHIN THE FIELD OF EDUCATION: ITS ORGANIZATION AND ENCOURAGEMENT

EDWARD C. ELLIOTT
Director of Course for the Training of Teachers, University of Wisconsin

There are two important factors that may not be disregarded in any consideration of ways and means for the encouragement and better organization of co-operative research in education. The first arises from the fact that, under the existing conditions of the professional training of teachers, the largest proportion of the energy of university and college departments of education of necessity flows out through the channels of classroom teaching and the many extra-mural activities involved in stimulating public endeavor and in spreading the propaganda of modern education. This is conspicuously the situation in the state universities and colleges. Men are kept too steadily at the day's work to attack in any satisfactory manner the problems of scholarship.

In the second place, there is an easily detected tendency today in the scientific study of education, to devote too serious attention to minute issues, too far removed from any possibility of contributing to the intelligent appreciation of the problems that press for solution. The first factor referred to has resulted in a relatively large amount of superficial effort in investigation; the second, if not hindered in its development, promises to produce a new form of scholasticism in education, a scholasticism as barren of service to human life, not to say real scholarship, as was the scholastic period of mediaeval thought.

The pre-eminent demand today is for intensive, detailed study of those forces that dominate the educational situation, particularly in the lower schools of the country; which will enable a clear interpretation of the products of these forces. These dominating forces are too large and their attendant phenomena too complex and too numerous to permit of satisfactory individual study. Only through a wise co-ordination of facilities and of institutions,

and by organized co-operation of individuals shall we be able to understand these forces and to weigh their results.

Three illustrations of the type of the larger educational problems in mind may briefly be indicated. In one way or another, the development and betterment of the practice of education (and this perhaps is the one worthy ideal of the scholarship and investigation we have before us) are dependent upon financial resources. The relation that obtains between taxation and the public school is, at the best, only imperfectly understood. The position of the point of maximal efficiency in the expenditure of public moneys for education is known only within limits of the roughest approximation. A scientific, comprehensive, comparative survey of the financial factors of education in two dozen typical American cities would, it may safely be affirmed, lead to an understanding of things not now understood, and to necessary reconstructions of the foundation support of public schools. The same general sort of financial survey for a half-dozen states would enable the establishment of a new branch of the science of education, namely, educational economics. These things are not possible, however, until there is consistent and concerted action among a group of those who know why and how. The day of the elevation of the compensation of all grades of teachers in public service to a professional level in accordance with a plan that is practical and economically possible will not arrive until investigators in education form a vicarious trust.

The comparative study of legislation opens a field for constructive research, not less important than the field of educational finance. Each one of our states is a great laboratory for experiments in education. The social problem of education is the effective education of masses of individuals. The directive power of the state becomes more and more instrumental to this end. The study of the forms, mode of operation, and above all, the results of experimental legislative measures, is fundamental to the rational development of our American public education. Obviously, though, the intricacies and comprehensiveness of such study necessitate scientific team work.

A scientific study of secondary educational theory and practice

must be made in the near future. At no point is the scholasticism and anarchism of modern education more evident than here. It is possible to measure the productiveness of the secondary school far more accurately than is commonly believed. The basal question of educational values will continue to be controlled by the philosophy of *ipse dixit*, until those who aspire to extend the frontier of our knowledge of education combine to analyze and measure the results of the modern high school in accordance with recognized scientific standards.

From any point of view, the rational, valid investigation of education, and the consequent acceleration of educational reform, will come only after the release of our science from the prevailing individualism. If, for instance, this Society of College Teachers of Education would concentrate its energy upon the mapping of a research problem of worth, it is not inconceivable that the United States Bureau of Education, in the course of its probable development, might be enabled to devote appropriate resources for the actual conduct of the research; or, perhaps, one of the great foundations might be led into a new avenue of usefulness. The peculiar character of all educational research necessitates as a fundamental condition for its success a scientific responsible direction which now, all must admit, does not exist.

ACCELERATION AND RETARDATION IN THE MENTAL DEVELOPMENT OF THE SCHOOL CHILD

H. H. FOSTER
Department of Philosophy and Education, Ottawa University

The questions to be answered in the investigation:

1. Is the child's mental development uniform in rate, or are there in the mental sphere periods of retardation and acceleration analogous to those of physical development? (Preliminary studies seem to indicate the existence of such periods.)

2. Is the mental development parallel in different individuals? In the two sexes?

3. To what degree are mental and physical development correlative?

The method of investigation might be a comparative study of such factors as—

1. Teacher's judgment of the child.

2. Child's class standings, including his record of promotions and failures.

3. Child's reaction time.

Sources of error would be—

1. The prejudice of teachers in favor of an ideal and imaginary rather than the actual rate of development.

2. Special conditions of health, environment, etc.

The relative importance of these factors and the method of dealing with them could be determined only after a preliminary experimental study.

Educational implications, as regards curriculum, co-education, etc.

TO WHAT EXTENT ARE CHILDREN OF THE FIFTH GRADE IN THIS CITY BEING TAUGHT GENUINE COMPOSITION?

JOHN W. HALL
Professor of Elementary Education, College for Teachers, University of Cincinnati

The material necessary to be collected for the investigation should be collected through the authority of the superintendent of schools. This material should be sets of the best six compositions on each topic that has been given for the months of October and April. The requests should be made at the end of the former month and at the beginning of the latter. This would insure the compositions being saved in the latter case so that copies of every set could be had, and the teacher knowing that these compositions were to be called for, it might serve to accentuate the points of what she considered to be good composition.

The following questionnaire should accompany each request and be answered for each of the months indicated:

1. Give the subjects of compositions written by your class during the four weeks ending ———.

2. Send the six best of each set and answer for each set: Is this the first writing of this set or has it been copied? If copied, why was it copied?

3. What was done in preparation for each composition? About how much time did it take? How much time was given to the first writing of each set?

4. If copied, about how much time was spent in copying? Was this done in composition or in writing hour?

5. What use was made of the compositions?

6. State briefly, if you can, how you give the class the benefit of your criticisms.

7. State briefly the three most striking defects in each set that caught your attention.

The following questionnaire should be given to the children of these same teachers—at least to part of the classes distributed so as to make it representative—and given if possible by the investigator with the regular teacher out of the room:

1. Write the names of the following subjects, placing the one you like best first, next best, next, and so on: composition, geography, reading, arithmetic, spelling, history. (Composition is placed first in the list so as to give it the benefit of position.)

2. Tell, if you can, why you like or dislike composition.

3. Which do you like better, writing a new composition or copying a corrected one? Tell why, if you can.

Reading of the compositions.—All of the compositions ought to be read by each of three or four competent readers and marked according to the following headings with Grades 10, 9, 8, 7, 6, or excellent, good, fair, poor, very poor.

Form.—Spelling, penmanship, margins, paragraphing, punctuation.

Content.—Choice of words, individuality, organization, richness of content, connectedness of thought, force.

Aside from the obvious points in the questionnaire the investigator will wish to see what evidence there is that the teachers have sought a new point of view, or an interesting problem for the composition, that would necessitate anything more than mere reproduction. He will wish also to discover what evidence there is of desire on the part of the teachers to provide a situation that would furnish a genuine motive for the composition.

SUGGESTIONS FOR CO-OPERATIVE RESEARCH IN EDUCATION

PAUL H. HANUS
Professor of Education, Harvard University

It is apparent that the guidance we need in educational practice consists of principles that possess established validity. These principles may be obtained by the method of co-operative research.

This method consists in the collection of data, the formulation of provisional principles suggested by the study of these data, and the testing of the principles thus obtained by applying them to practice. All this must be done by competent and disinterested persons organized for the purpose. In view of the urgent need for such guiding principles in educational practice, it is important that cities and states should take steps to secure co-operative research in education as defined above, at first by suggestion and persuasion, ultimately by statute, if necessary; and that we should enlist the co-operation of the National Bureau of Education.

Incidentally, it may be said that co-operative research in education presents an unusual opportunity to any educational philanthropist who may discern its importance and provide the necessary funds to carry it on, through university departments of education, or in a separate institution devoted wholly to this purpose.

Two illustrations of procedure on the basis of the foregoing suggestions are offered. These illustrations can be given in outline only, on account of the brevity demanded by the society's editor.

I. It is well known that the time devoted to arithmetic varies greatly; in some elementary schools it is from two to four times as great as in others; also that drill in arithmetic is begun in some schools in the first grade, while in others such drill is not begun till later. It is alleged, on the one hand, that the achievements of the pupils in arithmetic would be improved if more time were devoted to the subject, and if drill in arithmetic were not begun until the second or third grade; on the other hand, it is alleged that the variations in the time devoted to arithmetic and of the time at

which drill in arithmetic is begun do not affect the achievements of the pupils. The questions to be settled are: How much arithmetic ought a pupil to know when he is fourteen years old? When should drill in arithmetic commence? and, What time allotment is required to achieve the desired results? These questions can be settled only by co-operative research, as follows:

1. Secure assent for the sake of the experiment to a description of the quality and quantity of the attainment in arithmetic a pupil should have made when he leaves the elementary school; say accuracy and reasonable facility in addition, subtraction, multiplication, and division of whole numbers and simple fractions, both common and decimal; percentage and its simplest applications to interest, trade discount, taxes, and insurance. (Just what this means should be definitely formulated.)

2. Secure assent, as before, on the basis of general experience, to the amount of time, date of beginning, and a method of teaching, or methods of teaching, to accomplish the achievement suggested in 1.

The defined amount of arithmetic and the specified facility constitute provisional principles that may be used as a guide to practice.

3. We next have to test the validity of these principles, i.e., to determine, by actual experiment, how long it takes to achieve the result described in 1; when the pupil's drill in arithmetic begins in the first grade, and when it begins in a later grade; and by further inquiry to determine its sufficiency for the ordinary affairs of life and for further progress in mathematics. This experiment must be carried on for a sufficiently long period, say ten years, and over a sufficiently wide area, and in classes whose total enrolment amounts to ten thousand pupils; and the results of this experiment must be appraised by competent persons who, in general, are not connected with the school systems in which the experiment has been carried on.

II. It is alleged that Latin is better than a modern language for giving pupils an appreciative understanding of the grammar of the venacular, and hence that Latin is to be preferred for high-school pupils to any modern language, for this purpose.

This allegation may be adopted as a provisional principle of procedure. To test its validity, try the experiment of testing the knowledge of English grammar possessed by pupils who, on the one hand, have studied only a modern language, and, on the other hand, only Latin, during their high-school careers. Apply this test for a number of years, say five, to not less than ten thousand pupils, and have the results appraised by competent disinterested persons, as before.

CO-OPERATIVE STUDY OF A PROBLEM IN THE TEACHING OF ENGLISH

CHARLES MAXWELL McCONN
University of Illinois

Problems in the special pedagogy of individual subjects may be capable of solution by co-operative methods, no less than general educational problems.

In the English section of the High-School Conference of the University of Illinois on November 18, 1910, the writer made an appeal for such study of that old crux of English teaching, the selection of classics "for study and reading." Sixty teachers in about fifty different schools definitely agreed to co-operate in the simple plan proposed.

Each one of these sixty teachers will ask his or her students to rank the books they read in school this year in the order of their preference—putting first the ones they really liked best themselves and felt they got most out of, and so on. The students will be asked to sign their names (so that the sex will be indicated on each ranking) and to put down their ages and high-school classes or years. The teachers will be asked to make a ranking also *before* the students make theirs.

Assuming that each of the sixty teachers has on the average not less than fifty pupils in English, we shall thus get over three thousand rankings of the books in the present list of college entrance requirements, made by the high-school students themselves, with the sex, age, and grade indicated on each ranking, together with over fifty rankings by their teachers.

The rankings will be tabulated to show how many times each book that appears is ranked first, how many times second, third, ninth, tenth, and so on. If we find any book or group of books that is ranked low in a large percentage of the lists, this would certainly seem to indicate that the book or group is open to serious question. We shall have a basis, on the other hand, for including more books of the type represented by general favorites. In other

words, we may hope to have at last something like definite data on which to base a revision of the much-discussed college entrance requirements.

We shall be able, further, to study the differences in the ranking of different kinds of books by the boys and by the girls; the differences that seem to correspond to the different ages and to the different years in the high-school course; and the similarities that may appear between the rankings of teachers and those of their pupils, boys and girls, at different stages. The bearing of such data on many problems of adolescent psychology and pedagogy is obvious.

STUDIES OF SCHOOL SUBJECTS THROUGH INSTRUCTION

M. V. O'SHEA
Professor of Education, The University of Wisconsin

I think a profitable line of research to be undertaken in education is to have trained psychologists investigate the most effective and economical processes of learning in respect to the ordinary subjects of study in the elementary school and the high school. Such work as that done recently by Dearborn in the psychology of reading, and by Swift, Book, and others on processes of learning in special fields, should be done in respect to all the subjects of instruction, so far as possible. Of course, any one investigator can undertake only particular topics in any subject, as arithmetic, geography, algebra, grammar, and the like; but if we can secure co-operative research, it should be feasible to have a variety of topics under investigation constantly.

Others can suggest better than I what laboratory methods may prove effective in the study of different topics; but I am myself having investigations carried on this year which I think will yield some results of value. Graduate students, well trained in general and experimental psychology, have taken individual pupils, and are teaching them for one hour every day certain topics in English grammar, in English composition, and in arithmetic. The purpose in this work is to observe the reaction of the pupils upon the subject-matter being presented to them, with a view to noting the interest aroused by different methods employed, the readiness with which facts and principles are apprehended, the efficiency with which they may be used in concrete situations, and the thoroughness with which the facts and principles gained are retained. A daily record is kept of the observations and impressions of the teacher and observer. This seems to me to be a thoroughly feasible and a really profitable method of investigating educational problems, provided it can be employed by competent psychologists, who can work for a long period with individual pupils, or at least with groups

of not more than three or four. It is impossible to carry on effective research with classes of the usual size in the schools.

The results which my students will get may lack statistical and mechanical accuracy; but what they lack in these respects, I think they may gain in qualitative values. After all, one thing we need in education, it seems to me, is investigation which will show the changes wrought in the reactions of a child who has been taught certain materials and by certain methods, and who has been observed for a considerable period without any interruption, and without any extraneous forces operating on him in respect to the particular matter under observation. The investigator must keep a close watch on his subject week after week and month after month, noting, so far as practicable, all factors of stimulation and reaction.

IMPROVEMENT OF TEACHERS

W. S. SUTTON
Dean of the Department of Education, University of Texas

I suggest that the study of the "Problem of Improvement of Public-School Teachers Already in the Service" would be a valuable contribution to educational progress. The publication of that study, I am confident, would be appreciated by school superintendents throughout the country.

The problem could be considered under these two heads:

1. What plans now obtain for the improvement of teachers in the several states?

2. How should these plans be unified, and what improvements should be made?

Much labor would be involved in answering the first question if an accurate survey be made. It would be a difficult matter to gather together data relating to city teachers' institutes, county teachers' institutes, summer normal institutes, summer schools for teachers, university extension courses for teachers, grade meetings for teachers, principals' round tables, meetings of school principals and the teachers supervised, parents' and teachers' associations (local and state), reading circles (local and state), teachers' associations (local, state, and national), educational publications, and the laws which are now on the statute books of American states, which relate to the improvement of teachers. A study of the practice which obtains in foreign countries also should be undertaken.

The answer to the second question would be determined in the light of the answer to the first, and in the light of sound educational philosophy.

It is probable that before a final answer be given, a study of the laws relating to the certificating of teachers will become necessary.

METHODS, DISCIPLINE, TESTS

GUY MONTROSE WHIPPLE
School of Education, Cornell University

In my opinion the time is ripe for the undertaking of numerous investigations in the schoolroom itself upon the relative merits of different methods of teaching the various subjects of the curriculum. The "Experiment on Methods of Teaching Zoölogy," reported by J. P. Gilbert in the *Journal of Educational Psychology*, June, 1910, and Cornman's well-known investigation of the teaching of spelling in the elementary school may serve as patterns of what I have in mind. Studies similar to Gilbert's may be made with regard to the teaching of physics, chemistry, and botany.

Again, the question as to whether geometry and algebra do or do not have a formal value in training pupils in the forms of thought involved in them may be investigated; likewise the question may be investigated as to whether instruction in science in the high school does or does not develop in the pupils notions of scientific method or the scientific "point of view" in such a manner as to apply to the solution of problems arising in the mind of the pupil when he is concerned in activities that lie outside the schoolroom.

Yet again, the assertion that science teaching trains pupils to habits of accurate observation may be studied by the aid of such forms of test as have developed in connection with the psychology of testimony.

Finally, we need extended experiments designed to furnish standards of performance in the execution of various mental tests so that ultimately we may be able to compare the performance of the individual pupil in these tests with the normal performance for his age as exactly as we now compare his standing in various physical and anthropometric tests with the norms for those tests. The methods by which these investigations are to be carried on cannot, for want of space, be set forth here. I have sought to call attention to this phase of experimental pedagogy in a recently published *Manual of Mental and Physical Tests.*

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2. The Organization of the Department of Education in Relation to Other Departments in Colleges and Universities: W. S. Sutton, Bolton; published in "Journal of Pedagogy," New Rochelle, New York, December, 1906, and March, 1907.
3. The History of Education: Burnham, Thorndike; published as a bulletin at Teachers College Columbia University, 1908.

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4. Observation and Practice Teaching in College and University Departments of Education: Farrington, Strayer, Jacobs; published in pamphlet form by the Society, 1909. Price 53 cents, postpaid.
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